

Call for Proposals

Title: Bottomland Hardwood Hydrology in River Basins within the Post Oak Savannah, Blackland Prairie, and Pineywoods Ecoregions.

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Introduction

Across Texas the most important wildlife habitats, containing the highest number of rare species and the most threatened, are native prairie and riparian habitats. These riparian areas include Bottomland Hardwoods (BLH) in the major river basins (e.g. Trinity, Sabine, Sulphur, and Red River) within in the Blackland Prairie Ecosystem, which is classified as a Tier 1 priority within the Texas Wildlife Action Plan (TCAP, TPWD 2005, 2012). Programs and initiatives that have bottomlands listed as important, if not critically important, include the East Texas Black Bear Task Force 10-year plan, TPWD Waterfowl Strategic Plan, North American Waterfowl Management Plan, North American Land Bird Conservation Plan, North American Bird Conservation Initiative, North American Waterbird Conservation Plan, Wetland Reserve Program, Lower Mississippi Valley Joint Venture, Oaks and Prairies Joint Venture, etc.

Throughout these major river basins in East Texas, BLH systems have been degraded or lost due to many factors. One factor is alteration of hydrologic regimes within all river basins in Texas. Reservoir construction, dredging, drainage, flood control levees, road construction, and clearing for agriculture have all been associated with habitat loss and hydrological alteration. It is estimated that 75-95% of the BLHs in East Texas have been lost due to degradation or outright conversion to other uses, such as reservoirs or agriculture. In the Trinity Basin alone, there are 25 reservoirs, including 14 major reservoirs with a combined storage of 6.9 million acre-feet (TWDB 2002). Additionally, much of the best remaining hardwood forests are threatened by future reservoir construction and altered hydrological conditions which threaten species diversity and future functionality of stands.

Because of the immensity of habitat loss and the number of threatened/sensitive species that occur in this habitat type (see SGCN section), there is an ongoing effort to restore and improve biodiversity in these bottomland systems. Many governmental programs, both State and Federal, have cost-share practices. However, to date, there has been no research examining altered hydrology and its impacts to restoration and long-term management of these systems.

In addition, numerous attempts at BLH restoration throughout East Texas have been largely unsuccessful. Several studies have been conducted at the Richland Creek Wildlife Management Area (RCWMA). The poor survival of re-established oaks and hickories observed during these studies has been attributed to extreme drought or flooding (i.e., altered hydrological regimes).

Private landowners, state agencies, federal agencies and NGO's are spending millions of dollars to re-forest floodplain sites throughout these river basins, thus it is critical for natural resource managers to have all available information to make recommendations for successful re-forestation efforts.

In 2014 TPWD began a new effort to determine effectiveness of seedling survival, by evaluating different planting techniques and thinning regimes on 3 species- Shumard oak, Pecan, and Bur oak. This project was coupled with a previously funded project at Old Sabine Bottom WMA where we evaluated methods to improve dynamics of existing stands. We have concluded that while understanding what practices improve survival is important, they cannot be separated from current hydrological conditions that likely play a major role in establishing and maintaining

these systems. Consequently, the prediction of additional hydrological changes brings greater concern.

Need or Justification Related to Division Priorities

There is a need to determine current forest stand dynamics using conventional and the Desired Forest Condition cruising methodology, as well as the need to determine current and historical hydrological conditions on WMAs in East Texas. The relationships between forest stand dynamics and current/predicted hydrological conditions are necessary to understand if management practices for which we have control are to be successful. In addition, understanding the relationship between hydrology, long-term stand development, and management actions are critical if we are to truly understand management concerns with BLH's into the future.

Effective regeneration processes need to be evaluated in a greenhouse, as well as under natural environmental conditions to better understand the link between seedling survival, hydrology, and shade. The methodology to determine isotopic content in shallow groundwater wells in conjunction with surface water and in-channel water to accurately evaluate the source of water that trees are using is critical, especially during drought. A scalable system for monitoring BLH systems in Texas is needed to include the entire Western Gulf Coastal Plains. All of these efforts are needed to better understand landscape-wide hydrological impacts on bottomland systems to guide future management actions across the landscape of East Texas.

Species of Greatest Conservation Need (Texas Wildlife Action Plan 2005)

High Priority SOC: *Breeding birds* Swainson's warbler (*Limnothlypis swainsonii* G4), Kentucky warbler (*Oporornis formosus* G5),
Mammals Rafinesque's big-eared bat (*Corynorhinus rafinesquii* G5 Threatened)

Medium Priority SOC: *Breeding birds* Red-headed woodpecker (*Melanerpes erythrocephalus* G5), Prothonotary warbler (*Protonotaria citrea* G5), Chuck-will's-widow (*Caprimulgus carolinensis* G5). *Wood stork* (*Mycteria americana* G4 Threatened).

Wintering birds Rusty blackbird (*Euphagus carolinus* G5) 11% decline mature bottoms. *Reptiles* Timber rattlesnake (*Crotalus horridus* G4 Threatened)

Mammals American black bear (*Ursus Americanus* G5 Threatened), Louisiana black bear (*Ursus americanus luteolus* State & Federal Threatened)

Low Priority SOC: *Breeding birds* Yellow-billed cuckoo (*Coccyzus americanus* G5), Wood thrush (*Hylocichla mustelina* G5), Eastern wood-pewee (*Contopus virens* G5)

- FWS focal species: wintering species Yellow-bellied sapsucker (*Sphyrapicus varius*).

- migratory waterfowl, including Wood duck (*Aix sponsa*) and Mallard (*Anas platyrhynchos*) will utilize hard mast during winter floods.

OBJECTIVES

- 1) Determine current forest stand dynamics on key WMA's, including, Richland Creek, Big Lake Bottom, Gus Engeling, Old Sabine Bottom, Caddo Lake, and Alazan Bayou;
- 2) Assess hydrologic and geomorphic alterations at WMAs and develop ideas to monitor and improve hydrologic conditions on the WMAs;
- 3) Develop methods to monitor groundwater in select BLH forests in East Texas using strategically located wells to account for site-specific variables - determine linkages between groundwater, surface water, and soil water;
- 4) Identify sources of water used by BLH trees in select BLH forests, how these sources have changed with hydrologic and geomorphic alterations and vulnerabilities of BLH to

these changes – compare and contrast with the hydrologic work to understand linkages between water resources and forests;

- 5) Identify if and where flood frequency of depressional floodplain wetlands (mainly sloughs) have changed and determine effects on waterfowl and fisheries;
- 6) Evaluate success of regeneration processes and the effects of flooding, drought, and shade on regeneration in BLH forests in Texas and in greenhouse experiments;
- 7) Determine long-term stand development and tree growth processes in selected BLH forests as affected by hydrologic change;
- 8) Provide technical training to WMA personnel through site visits and workshops to improve their experience and skill in managing given hydrologic and geomorphic modifications;
- 9) Develop a multi-scale monitoring program for BLH forests in East Texas with the intention of this methodology being implemented throughout the region (Mississippi Alluvial Valley, Louisiana and Oklahoma). The monitoring program should consist of coupled ground-based and satellite data. The entire project should be done in conjunction with larger partners, e.g. the Joint Ventures and LCCs, but there is some foundational science required to link the remote sensing to the field.

These objectives may be grouped together to reflect similar study locations, methods or procedures with separate supplemental budgets to meet differing available funding levels. For example, objectives 1-2, 3-4, 5, 6-7, 8 and 9 respectively, could likely be grouped into separate segments or phases to meet differing funding levels that could be applied for in subsequent years as funding is available. The most credit will given to proposals that meet all objectives and are technically sound, though we realize that meeting all objectives listed above under the funding limitations of one proposal may not be realistic. This includes an experimental greenhouse as well as field component of multiple study sites (e.g., Wildlife Management Areas within the Trinity, Sabine, Sulphur, and Red River Basins). Other study sites may be located on the Neches, Angelina, Lower Sabine, and Cypress Basin in the Western Gulf Coastal Plains ecoregion which contains numerous priority Tier 1 habitat types priorities within the TCAP.

Potential partners on the project include NRCS for funding and study sites, USFWS for funding and study sites, TPWD Wildlife Division for funding, study sites, and project implementation, TPWD Fisheries Division for funding, Lower Mississippi Valley Joint venture for project support.

Total project will not exceed \$500K in TPWD project costs without resubmittal in future years.

EXPECTED MANAGEMENT IMPLICATIONS

The information from the aforementioned objectives will be used to guide natural resource restoration with the best methods to manage existing stands under the face of uncertain hydrologic regimes. This will include regeneration techniques for desirable hardwood species, as well as stand management techniques for existing BLH in the major river basins throughout East Texas. The techniques and research results can be demonstrated to interested partners and landowners through technical notes and workshops as well as presentations at major conservation venues and in appropriate peer reviewed journals.

LITERATURE CITED

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